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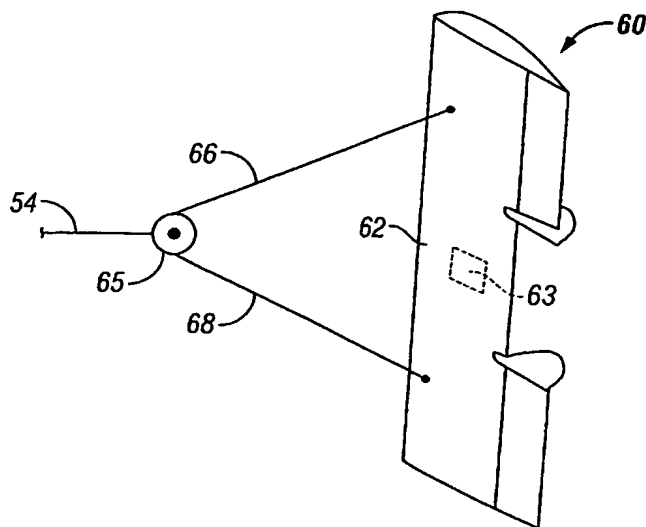
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[Continued on next page]

(54) Title: SYSTEM FOR DEPTH CONTROL OF A MARINE DEFLECTOR



(57) Abstract: A system for adjusting a deflector in a seismic survey comprises a generally upright deflector body and at least one bridle connected to a seismic cable. The bridle includes an upper segment secured to an upper connection point on the deflector body, and a lower segment coupled to a lower connection point on the deflector body. The upper bridle segment, lower bridle segment and deflector body define a geometry between themselves. This geometry is adjustable by at least one actuator so as to control the tilt angle of the deflector body.



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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 574 723 A (BABB HARVEY M ET AL) 11 March 1986 (1986-03-11) the whole document column 5, line 35 - line 51 column 6, line 4 - line 16; figures 1-5	1-70
X	WO 00/76839 A (SHATTOCK BERNARD AUBREY) 21 December 2000 (2000-12-21) page 1, line 1 - line 14; figures 1-6 page 12, line 22 - page 13, line 22 page 18, line 4 - line 6 the whole document ----- -/--	1-70

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 122 562 A (SEISMOGRAPH SERVICE) 18 January 1984 (1984-01-18) abstract; figures 1-4 the whole document page 2, line 32 - line 50 -----	1,2,9, 11,26, 30,31, 35-38,49
X	BE 497 522 A (TNO NEDERLAND) 1 December 1950 (1950-12-01) figure 3 -----	40
A		3
X	US 2 980 052 A (FEHLNER LEO F) 18 April 1961 (1961-04-18) column 1, line 54 - line 69; figures 1-4 the whole document -----	40-70
A	DE 976 740 C (EMMA SUEBERKRUEB) 2 April 1964 (1964-04-02) figures 1,2 -----	1-70
X	US 4 991 534 A (WARNAN FRANCOIS ET AL) 12 February 1991 (1991-02-12) abstract; figures 1,3-5 -----	49
A	EP 0 168 959 A (TEXAS INSTRUMENTS INC) 22 January 1986 (1986-01-22) abstract; figures 4,5 -----	1-70
A	US 5 357 892 A (VATNE ODD O ET AL) 25 October 1994 (1994-10-25) cited in the application the whole document -----	1-70

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4574723	A	11-03-1986	NONE	
WO 0076839	A	21-12-2000	AT 238943 T AU 757879 B2 AU 5094400 A CA 2374496 A1 CN 1355750 T DE 60002463 D1 EP 1187757 A1 WO 0076839 A1 NO 20016104 A	15-05-2003 13-03-2003 02-01-2001 21-12-2000 26-06-2002 05-06-2003 20-03-2002 21-12-2000 14-02-2002
GB 2122562	A	18-01-1984	NO 832339 A	29-12-1983
BE 497522	A		NONE	
US 2980052	A	18-04-1961	US 2960960 A US 2981220 A	22-11-1960 25-04-1961
DE 976740	C	02-04-1964	NONE	
US 4991534	A	12-02-1991	FR 2637561 A1 CA 1331319 C GB 2223728 A ,B	13-04-1990 09-08-1994 18-04-1990
EP 0168959	A	22-01-1986	CA 1241103 A1 DE 3564410 D1 EP 0168959 A1 NO 852459 A ,B, US 4719987 A	23-08-1988 22-09-1988 22-01-1986 20-12-1985 19-01-1988
US 5357892	A	25-10-1994	NO 921155 A NO 930904 A DE 69302513 D1 DE 69302513 T2 EP 0562780 A1	27-09-1993 13-09-1994 13-06-1996 19-09-1996 29-09-1993